Notice of Allowability	Application No.	Applicant(s)	
	10/603,803	DOWLING, ERIC MORGAN	
	Examiner	Art Unit	
	Phuong Phu	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the application filed on 6/24/03*.

2. ☒ The allowed claim(s) is/are *1-21*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 6/26/03
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Eric Dowling on 1/23/06.

The application has been amended as follows:

IN THE CLAIMS:

-In claim 1, line 26, the limitation "$O(N^2)$" is deleted.

-In claim 1, line 26, after the limitation "matrix multiplication operations", the phrase --of order or complexity N^2 wherein L and N are integers-- is inserted.

-In claim 5, line 3, after the limitation "signal vectors,", the phrase --wherein N is an integer,-- is inserted.

-In claim 10, line 3, after the limitation "vectors,", the phrase --wherein N is an integer,-- is inserted.

-In claim 10, line 5, after the limitation "channel vector,", the phrase --wherein L is an integer,-- is inserted.

-In claim 19, line 3, after the limitation "vectors,", the phrase --wherein N is an integer,-- is inserted.

-In claim 19, line 14, the limitation "the time domain" is replaced with --a time domain--.

REASONS FOR ALLOWANCE

2. Claims 1-21 are allowed.

3. The following is an examiner's statement of reasons for allowance:

References 6212229, 6434190, 6411657 and 6377631 are cited because they are pertinent to the claimed invention.

-Regarding to independent claim 1, none of prior art of record teaches or suggests a method comprising procedures of estimating an impulse response convolutional model for a band limited wireline communication channel to define an L-element channel vector, whereby the channel output to a given one of the time domain signal vectors is modeled as being substantially equal to a linear convolution of the channel vector with the respective N-element time domain signal vector, plus a noise vector; and precoding each of a set of frequency-domain encoded data blocks using a precoder to derive a set of precoded data vectors, wherein the precoder comprises: a set of precoder parameters which are each at least partially derived from the L-element chalmel vector, the precoder parameters comprising a precoder feed forward parameter vector, and a precoder feed feedback parameter vector, a point-wise feed forward multiplier that multiplies each element of an internal precoder feed-forward vector with a corresponding element of the precoder feed forward parameter vector, and a point-wise feed back multiplier that multiplies each element of a precoder feed-back vector with a corresponding element of the precoder feed feedback parameter vector.

-Regarding to independent claim 5, none of prior art of record teaches or suggests a system comprising a software which comprises a first function that causes one or more training

signals to be sent through a wireline communication channel to a far-end receiver to cooperatively estimate a set of channel parameters for a parametric model, wherein the parametric model models how signals are modified by a band-limited wireline communication channel as the signals pass through the band-limited wireline communication channel to the far-end receiver; a second function that causes a set of precoder parameters to be computed at least partially based upon the channel parameters, the precoder parameters comprising a precoder feed forward parameter vector and a precoder feedback parameter vector; and a third function that causes each of a set of frequency-domain encoded data blocks to be transformed to a set of precoded data vectors, wherein the third function comprises: a point-wise modulo reduction function that causes a set of integer modulo reduction operations to be applied to each of the real and imaginary components of a plurality of elements of a frequency domain vector, a point-wise feed forward multiplier function that causes each element of an internal precoder feed-forward vector to be point-wise multiplied with a corresponding element of the precoder feed forward parameter vector, and a point-wise feed back multiplier function that causes each element of a precoder feed-back vector to be point-wise multiplied with a corresponding element of the precoder feed feedback parameter vector.

-Regarding to independent claim 10, none of prior art of record teaches or suggests a method comprising procedures of estimating an impulse response convolutional model for a band limited wireline communication channel to define an L-element channel vector, whereby the channel output to a given one of the time domain signal vectors is modeled as being substantially equal to a linear convolution of the channel vector with the respective N-element time domain signal vector, plus a noise vector; and precoding each of a set of frequency-domain

encoded data blocks using a precoder to derive a set of precoded data vectors, the precoder comprising a set of precoder parameters which are each at least partially derived from the L-element channel vector; wherein the precoder parameters are selected and the precoding is performed to compensate for time-domain inter-vector interference that would otherwise be introduced by transmitting time domain signal vectors through the band limited wireline communication channel.

-Regarding to independent claim 19, none of prior art of record teaches or suggests a system comprising procedures of sending training signals through a wireline communication channel to a far-end receiver to cooperatively estimate a set of channel parameters for a parametric model, wherein the parametric model models how signals are modified by a band-limited wireline communication channel as the signals pass through the band-limited wireline communication channel to the far-end receiver; and precoding each of a set of frequency-domain encoded data blocks using a precoder to derive a set of precoded data vectors, the precoder comprising a set of precoder parameters which are each at least partially derived from the channel parameters, the precoder further comprising a point-wise modulo reduction unit that applies a set of integer modulo reductions to an intermediate precoder vector in a transform domain different from a time domain of the signal vectors; wherein the precoder parameters are selected and the precoding is performed to compensate for time-domain inter-vector interference that would otherwise be introduced by transmitting time domain signal vectors through the band limited wireline communication channel.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue

fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuong Phu whose telephone number is 571-272-3009. The examiner can normally be reached on M-F (6:30-2:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PHUONG PHU
PRIMARY EXAMINER

Phuong Phu
01/24/06

Phuong Phu
Primary Examiner
Art Unit 2631